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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,846	03/19/2004	Yi Hua Ma	1021.2005-001	7497
21005	7590	02/24/2006	EXAMINER	
HAMILTON, BROOK, SMITH & REYNOLDS, P.C. 530 VIRGINIA ROAD P.O. BOX 9133 CONCORD, MA 01742-9133			LAWRENCE JR, FRANK M	
			ART UNIT	PAPER NUMBER
			1724	

DATE MAILED: 02/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/804,846

Applicant(s)

MA ET AL.

Examiner

Frank M. Lawrence

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-57 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16, 19, 25-31, 34-44 and 47-57 is/are rejected.
- 7) ☒ Claim(s) 17, 18, 20-24, 32, 33, 45 and 46 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 47-57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 47, 51 and 56 are each indefinite because they state that the porous layer of hydrogen permeable material is selectively permeable to hydrogen gas, however the remainder of the claims 1-46 and the specification refer to the dense or solid layer being selectively permeable to hydrogen, while the porous layer is not selectively permeable. Claims 48-50, 52-55 and 57 are rejected for depending from a rejected parent claim.

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 40, 42-44, and 47-57 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The original specification does not disclose any of the limitations of claims 40, 42-44, 52 and 53. With respect to claims 47, 51 and 56, the amendment adds material that was not disclosed in the specification as filed for reasons given in paragraph 2 above. Claims 48-50, 52-55 and 57 are rejected for depending from a rejected parent claim.

***Double Patenting***

5. Claims 1-8, 12, 13 and 36-39 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 27 and 31-39 of copending Application No. 10/804,847. Although the conflicting claims are not identical, they are not patentably distinct from each other because all of the limitations of the instant claims are fully encompassed and envisioned by the co-pending claims. One having ordinary skill in the art would understand that the composite membrane is capable of functioning over a range of thicknesses and that the Group IB metal would be chosen from silver, copper, or gold based on cost, availability and effectiveness.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 47, 48, 50 and 51 are rejected under 35 U.S.C. 102(b) as being anticipated by Edlund (5,498,278).

8. Edlund '278 teaches a method of purifying hydrogen, comprising selectively permeating hydrogen across a composite membrane, wherein the membrane includes a tubed-shaped porous metal support that can be palladium, a metal oxide intermediate layer overlying the support, and

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a palladium or palladium alloy membrane layer that is deposited on the intermediate layer (col. 7, line 23 to col. 9, line 15).

9. Claims 1, 12, 13, 15, 25-29, 35, 47, 49, 50 and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Peachey et al. (5,738,708).

10. Peachey et al. '708 teach a composite metal membrane for selectively permeating hydrogen from a gas mixture, comprising a porous metal substrate, an intermediate metal oxide or metal sulfide layer deposited on the substrate, and palladium or Pd/Ag alloy hydrogen permeable layers deposited on the intermediate layer on each side of the substrate (col. 2, line 58 to col. 4, line 12).

11. Claims 36-39, 41, 47, 49-52 and 54-57 are rejected under 35 U.S.C. 102(b) as being anticipated by Bossard (6,183,542).

12. Bossard '542 teach a membrane for selectively permeating hydrogen from a gas mixture, comprising a palladium or Pd alloy membrane layer (30) that is sandwiched between two porous mesh layers (32, 34) that can be stainless steel using brazing with a layer of brazing powder. Multiple layers of mesh having differing sizes can be added to each side of the membrane (col. 5, line 1 to col. 6, line 13). The mesh and membrane layers are contoured (figures 2, 3).

13. Claims 1, 10-13, 15, 25-29, 35, 47, 49 and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Drost et al. (2002/0020298).

14. Drost et al. '298 teach a supported membrane for selectively permeating hydrogen from a gas mixture, comprising porous or sintered metal support layer (3), an intermediate porous diffusion barrier layer (9) deposited on the support layer, and a palladium or Pd/Ag alloy membrane layer (2) deposited on the intermediate layer using chemical or physical vapor

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deposition (paragraphs 17-20, 34, 38, 39, 52-58). The intermediate layer has a thickness of less than 2 microns and has a lower porosity than the support layer (see figures).

15. Claims 1-3, 9, 10, 12-16, 25-31, 34, 35, 47-49 and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Ma et al. (6,152,987).

16. Ma et al. (6,152,987) teach a composite membrane for selectively permeating hydrogen from a reaction product mixture, comprising a tubular porous stainless steel substrate (12), a ceramic or metal oxide intermediate diffusion layer deposited on the substrate, and a palladium or Pd/Ag alloy membrane layer deposited on the intermediate layer using electroplating or other deposition techniques (see figure, col. 1, lines 30-32, col. 3, lines 21-54, col. 4, lines 12-65, col. 5, line 45 to col. 6, line 38, col. 7, lines 21-60). Other metals such as Fe, Ni, Ti, Cr, Al and alloys may be used as the substrate material. The intermediate layer can have a thickness than can vary from a few microns to tens of microns, and a second metal oxide intermediate layer can be bonded to the first intermediate layer, anticipating the embodiment of claim 14. The first intermediate layer can be formed by oxidizing the surface of the substrate, anticipated the embodiment of claim 16.

### ***Claim Rejections - 35 USC § 103***

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

18. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al. '987.

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19. Ma et al. '987 disclose all of the limitations of the claim except that the intermediate layer is applied by electroless plating, but discloses that any conventional method can be used and that electroless plating is used to deposit the membrane layer. One having ordinary skill in the art at the time of the invention would have known to use electroless plating or any other suitable method that would effectively deposit the intermediate layer in a controlled manner and thickness.

### *Specification*

20. The incorporation of essential material in the specification by reference to an unpublished U.S. application, foreign application or patent, or to a publication is improper. Applicant is required to amend the disclosure to include the material incorporated by reference, if the material is relied upon to overcome any objection, rejection, or other requirement imposed by the Office. The amendment must be accompanied by a statement executed by the applicant, or a practitioner representing the applicant, stating that the material being inserted is the material previously incorporated by reference and that the amendment contains no new matter. 37 CFR 1.57(f). This objection refers to US Provisional Patent Application No. 60/457,061, which is cited as providing support for the material in claim 43.

### *Allowable Subject Matter*

21. Claims 17, 18, 20-24, 32, 33, 45, 46 and 53 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

*Response to Arguments*

22. Applicant's arguments filed January 23, 2006 have been fully considered but they are not persuasive. Applicant argues that claims 40, 42-44, 52 and 53 do not contain new matter and points out sections of the specification that provide support. This argument is not found persuasive because one skilled in the art would not be able to arrive at the claimed subject matter from what was originally disclosed. The fact that these claims were all copied from a co-pending application for the purposes of invoking an interference lends evidence to the fact that they were not disclosed in this application. For example, claim 40 recites that the first porous layer has a pore size that varies as a function of distance from the solid layer. Applicant cites page 11, lines 7-10 as providing support for claim 40, however this section only describes different mean pore sizes and not a pore size that varies based on its distance from the solid layer.

23. Applicant argues that Edlund '278 fails to disclose a porous layer of hydrogen permeable material in contact with and deposited on a solid layer of hydrogen permeable material, however the intermediate layer of the Edlund anticipates the porous layer and the membrane layer anticipates the solid layer.

24. Applicant argues that Peachey et al. '708 fail to disclose an embodiment where an intermediate porous metal layer overlies a porous metal substrate, and a dense hydrogen selective membrane overlying the intermediate layer, however it is submitted that the intermediate metal oxide or sulfide layer, porous metal substrate, and hydrogen permeable layers disclosed in Peachey et al. '708 anticipate the claimed arrangement.



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25. Applicant argues that Bossard '542 fails to disclose a porous layer formed of a hydrogen permeable material that is permeable to hydrogen gas, however the mesh layers anticipate the porous layer because hydrogen can pass through the layer. There is nothing in the specification defining the claimed terms in a way that would limit them to exclude a layer that is simply porous to hydrogen.

26. Applicant also argues that the Drost et al. '298 reference fails to disclose an intermediate layer that is porous, however the intermediate layer of Drost et al. must necessarily be porous because paragraph 39 states that the layers can be made of a material that has a good permeability for hydrogen. Hydrogen must pass through pores in the layer in order for the device to function, even if the pores are molecular in nature.

27. Applicant further argues that Ma et al. '987 fails to disclose an intermediate porous metal layer overlying a porous metal substrate, however it is submitted that Ma et al. discloses a porous substrate (12), a porous metal oxide intermediate diffusion layer deposited on the substrate, and a membrane layer deposited on the intermediate layer.

### ***Conclusion***

28. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

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CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Frank M. Lawrence whose telephone number is 571-272-1161. The examiner can normally be reached on Mon-Thurs 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Frank M. Lawrence  
Primary Examiner  
Art Unit 1724

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*Frank Lawrence*  
2-21-06